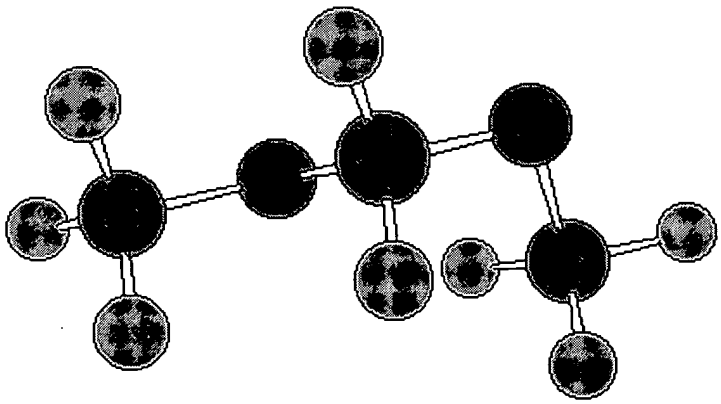
METHYLAL

IDENTIFICATION



$CH_3O - CH_2 - OCH_3$

METHYLAL

EINECS n°:	2037142	Also called :
CAS n°:	109 -87-5	Dimethoxymethane
UN n°:	1234	(I.U.P.A.C.) or
CTFA Name:	methylal	Methylene dimethylether.

PHYSICAL PROPERTIES

Methylal is a colourless, highly volatile solvent with a low boiling point, low viscosity and an excellent dissolving power.

Physical properties

Boiling point (1 atm):	42.3°C (108.14°F)
Molecular weight :	76.1
Density d20/4:	0.860
Viscosity (30°C) :	0.325 cps
Melting point :	-104.8°C (-156.64°F)
Surface tension (20°C) :	21.12 dyn/cm
Evaporation rate (DIN 53170) :	1.36 vs diethyl ether
	0.11 vs butyl acetate
Flash point (open cup) :	-18°C (-0.4°F)
Autoignition temperature :	237°C (458.6°F)
Explosion limits :	1.6 % vol (LEL)
	17.6 % vol (UEL)
Vapour pressure (20°C) :	44.10^3 Pa
Dielectric constant (20°C) :	2.645
Dipolar moment (20°C) :	0.74 D

Solvent Properties

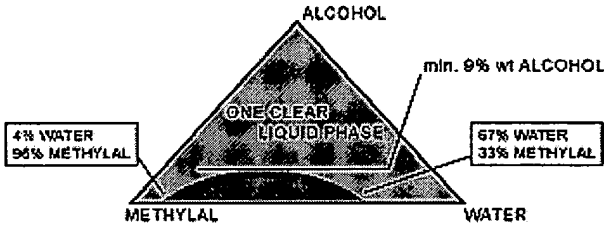
Methylal has an exceptional solvent power with medium polarity, conferring it a unique amphiphilic character.

Solubility parameters	in $Mpa^{1/2}$	in $cal^{1/2}\ cm^{-3/2}$

Hildebrandt (25°C) :	δ	17.5	8.5
Hansen			
dispersion :	δd	15.1	7.4
polarity :	δp	1.8	0.9
hydrogen bonds :	δh	8.6	4.2
Kauri-Butanol index (ASTM D 1133-90, gum 4939) : 164			

Miscibility

Methylal is fully miscible in organic solvents.
Methylal is partially miscible in water (up to 33 %).
In the presence of alcohol or a polar solvent, methylal is fully miscible in water, as is shown in the following ternary diagram :



CHEMICAL PROPERTIES

Methylal belongs to the acetal family.

Stability

Methylal has an excellent stability.

Hydrolysis :

in the presence of water, it is stable in basic and neutral medium. In acid medium, there is no hydrolysis if pH > 4.5 - 5.

Peroxides :

methylal does not form peroxides and does not need to be stabilized.
It can be regenerated without decomposition, and is suitable for all recycling processes.

Reactivity

Reactant of chloromethylation, methoxymethylation, transacetalization, methylenation.
Source of formaldehyde and methanol by acid hydrolysis.

APPLICATIONS

Thanks to

- an exceptional solvent power,
- its amphiphilic character : methylal is both hydrophilic and lipophilic,
- an extremely low viscosity,
- a low surface tension,
- a particularly high evaporation rate,

methylal finds applications in numerous fields :

- aerosols for cosmetic and technical applications

  methylal is an extraordinary solvent for aerosols and pump sprays thanks to its

  - excellent solvency
  - extremely low viscosity
  - compatibility with propellants, air and CO2 included
  - high evaporation velocity

  It improves the spray quality and the product performances, in solvent or water-based formulae.

- paints and varnishes

  A high solvency and low viscosity make methylal indispensable for metallic paints or wood varnishes.

- paint strippers

  The low molecular dimension, the low viscosity and surface tension associated with a high solvent power make methylal an excellent component of environment friendly paint strippers.

- cleaning and degreasing solvents

  Oleophilic character, solvency, extremely high volatility are helpful properties for cleaning solvent blending.

- pharmaceuticals

  Besides the galenic applications for which methylal is used as a carrier for active ingredients, methylal is a reagent in pharmaceutical synthesis and is used as a substitute for diethyl ether (no peroxides).

- synthesis - polymers - resins

  Methylal is a useful reagent for the production of ion exchange resins and crucial as a chain length regulator in the polyacetal resin manufacture.

- adhesives

  Unique solvent properties associated with quick drying are useful in glue formulations.

- extraction

  Good penetration capabilities, low toxicity and unique solvency parameters make methylal suitable for many extraction processes, for fragrances or aromas.

- fuel additive

  Smoke reduction.

- Insecticides

- etc...

LAMBIOTTE & Cie propose various methylal grades meeting the standards of the cosmetic, the pharmaceutical synthesis, the coating and the cleaning industry. LAMBIOTTE & Cie will be pleased to supply further information on the above applications.

SPECIFICATIONS

	Cosmetic grade	Anhydrous grade	Pure grade	Technical grade
Methylal	99.5 % min.	99.9 % min.	99.5 % min.	93 % min.
Methanol	< 1 ppm	< 0.05 %	>< 0.05 %	6.5 % max
Formaldehyde	< 1 ppm	< 0.005 %	< 0.0005 %	< 0.02 %
Water	< 0.5 %	< 0.03 %	< 0.5 %	< 0.25 %

VOC

HEALTH AND SAFETY

Toxicity

Methylal has an extremely low toxicity.

- TLV (MAK) :	1000 ppm
- Acute toxicity :	LD_{50} above 7 g/kg
- Acute inhalation toxicity :	LC_{50} = 15,000 ppm
	LD_{50} = 18,354 ppm
- Subacute inhalation :	NOEL = 4,000 ppm (8 x 6 h)
- Subchronic inhalation :	NOEL = 2,000 ppm
- Eye irritation :	minor to moderate
- Skin irritation :	none to slight
- Dermal sensitization :	not allergenic
- Ames test :	no mutagenic activity

Complete report available upon request.

Ecotoxicity

Methylal is a very safe product for the environment :

no effect of methylal observed on bacteria, Daphnids, fish (Brachydanio Rerio)
or green algae.

Methylal is biodegradable (ISO/DIS 8192)

Atmospheric chemistry of methylal

VOC The degradation of methylal in the atmosphere happens through its reaction with the hydroxyl radical because methylal does not photolyse. The formation of ozone needs several reactional steps and the velocity of the degradations during the added steps is extremely low. Therefore the contribution of methylal to the formation of tropospheric ozone **should be low**.

GWP Methylal has an atmospheric lifetime of 58 hours, which indicates that the global warming potential of methylal **is negligible**.

ODP Due to the absence of a halogenated atom, the Ozone Depletion Potential of methylal **is zero**.

HANDLING - STORAGE - TRANSPORT

Labelling

Methylal does not require a toxic or harmful label.

Methylal must be labelled as follows :

Danger symbol : F : highly flammable

Risk symbol : R11 : highly flammable

Safety recommendation phrases :

S9 : Keep the container in a well ventilated place.

S16 : Keep away from sources of ignition - No smoking

S33 : Keep precautionary measures against static discharges.

Storage

Methylal is stable under recommended storage conditions.

Recommended blanketing : air or dry nitrogen
Recommended temperature : maximum 37.8°C (100°F)
Recommended pressure : atmospheric
Bulk quantities : in the open, in detached carbon steel tanks
Small quantities : in a cool, dry, well ventilated area, protected from the sun

Transport

ADR Class 3, 2, b
I.D. n° : 33
IMCO : 3.1
UN n° : 1234

Properties are typical of average lots. Lambiotte makes no representation that the material in any shipment will conform to the values given. Specifications are available on request.